

Exercise - Variables and Expressions

1

Twice the product of m and n decreased by the square of the sum of m and n .

Which of the following is an expression for the statement above?

- A) $2mn - (m^2 + n^2)$
- B) $2mn - (m + n)^2$
- C) $(m + n)^2 - 2mn$
- D) $(m^2 + n^2) - 2mn$

2

The product of a number x and four decreased by twelve.

Which of the following is an expression for the statement above?

- A) $4x + 12$
- B) $4(x + 12)$
- C) $4(x - 12)$
- D) $4x - 12$

3

The quotient of 19 and a number d increased by seven.

Which of the following is an expression for the statement above?

- A) $\frac{19}{d} + 7$
- B) $\frac{d}{19} + 7$
- C) $\frac{19+d}{7}$
- D) $\frac{d+7}{19}$

4

Mario received y text messages each minute for 10 minutes yesterday and received t text messages each minute for 20 minutes today. What is the total number of text messages he received for two days in terms of y and t ?

- A) $30yt$
- B) $200yt$
- C) $20y + 10t$
- D) $10y + 20t$

5

Which of the following expressions represents the product of $3k$ and the sum of m and one third of n ?

- A) $3km + \frac{1}{3}n$
- B) $3k \cdot \frac{1}{3}(m + n)$
- C) $3k(m + \frac{1}{3}n)$
- D) $3k(m + n + \frac{1}{3})$

6

The difference between two numbers is eight. If the smaller number is n to the third power what is the greater number?

- A) $n^3 - 8$
- B) $n^3 + 8$
- C) $8 - n^3$
- D) $8n^3$

1-2. Exponents and Order of Operations

An expression like 3^5 is called a **power**. The number 3 is the **base**, and the number 5 is the **exponent**.

$$3^5 = \underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}_{5 \text{ factors of } 3}$$

To evaluate an expression involving more than one operation, we agree to perform operations in the following order .

Order of Operations

1. Simplify the expressions inside grouping symbols, such as parentheses, brackets, and fraction bars.
2. Evaluate all powers.
3. Do all multiplications and divisions in order from left to right.
4. Do all additions and subtractions in order from left to right.

Example 1 □ Evaluate $(11 - 20 \div \frac{5^2 - 13}{3} + 8) \times 2$.

<p>Solution</p>	$\begin{aligned} & (11 - 20 \div \frac{5^2 - 13}{3} + 8) \times 2 \\ &= (11 - 20 \div \frac{25 - 13}{3} + 8) \times 2 && \text{Evaluate power inside grouping symbols.} \\ &= (11 - 20 \div \frac{12}{3} + 8) \times 2 && \text{Evaluate expression inside grouping symbols.} \\ &= (11 - 20 \div 4 + 8) \times 2 && \text{Evaluate expression inside grouping symbols.} \\ &= (11 - 5 + 8) \times 2 && \text{Divide 20 by 4.} \\ &= (6 + 8) \times 2 && \text{Subtract 5 from 11.} \\ &= (14) \times 2 && \text{Evaluate expression inside grouping symbols.} \\ &= 28 && \text{Multiply.} \end{aligned}$
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Example 2 □ Evaluate $a^3 - \frac{b^2 + c}{a} + (ab + c)$ if $a = 4$, $b = -3$, and $c = 7$.

<p>Solution</p>	$\begin{aligned} & a^3 - \frac{b^2 + c}{a} + (ab + c) \\ &= 4^3 - \frac{(-3)^2 + 7}{4} + (4 \cdot (-3) + 7) && \text{Replace } a \text{ with 4, } b \text{ with } -3, \text{ and } c \text{ with 7.} \\ &= 64 - \frac{9 + 7}{4} + (-12 + 7) && \text{Evaluate } 4^3, (-3)^2, \text{ and } 4 \cdot (-3). \\ &= 64 - \frac{16}{4} + (-5) && \text{Evaluate expression inside grouping symbols.} \\ &= 64 - 4 + (-5) && \text{Divide 16 by 4.} \\ &= 55 && \text{Subtract and add.} \end{aligned}$
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Exercise - Exponents and Order of Operations

1

$$[(7^2 - 9) \div 8] \times 2 =$$

2

$$19 - 3[20 - \frac{2^4 - 7}{4} \times 8] =$$

3

$$\frac{72 \div 3^2 \cdot 2}{6} =$$

4

$$5^3 - \frac{1}{2}(12 + 12 \div 3) =$$

5

What is the value of $\frac{2c}{a}^2 - 10 \times \frac{(b+a)}{c}$
if $a = -2$, $b = 3$, and $c = 5$?

6

What is the value of $9 - 2x \div (z - y)^3$ if $x = 4$,
 $y = -1$, and $z = -3$?

7

What is the value of $\frac{7 \div (q)^2 \cdot 2}{2p} \cdot \frac{-p + 6q - r}{-q}$
if $p = 4$, $q = \frac{1}{2}$, and $r = 2$?

8

What is the value of $\frac{c - 2(a+b)}{(c-a)^2}$ if $a = -\frac{1}{2}$,
 $b = \frac{3}{2}$, and $c = \frac{5}{2}$?